FIG. 1

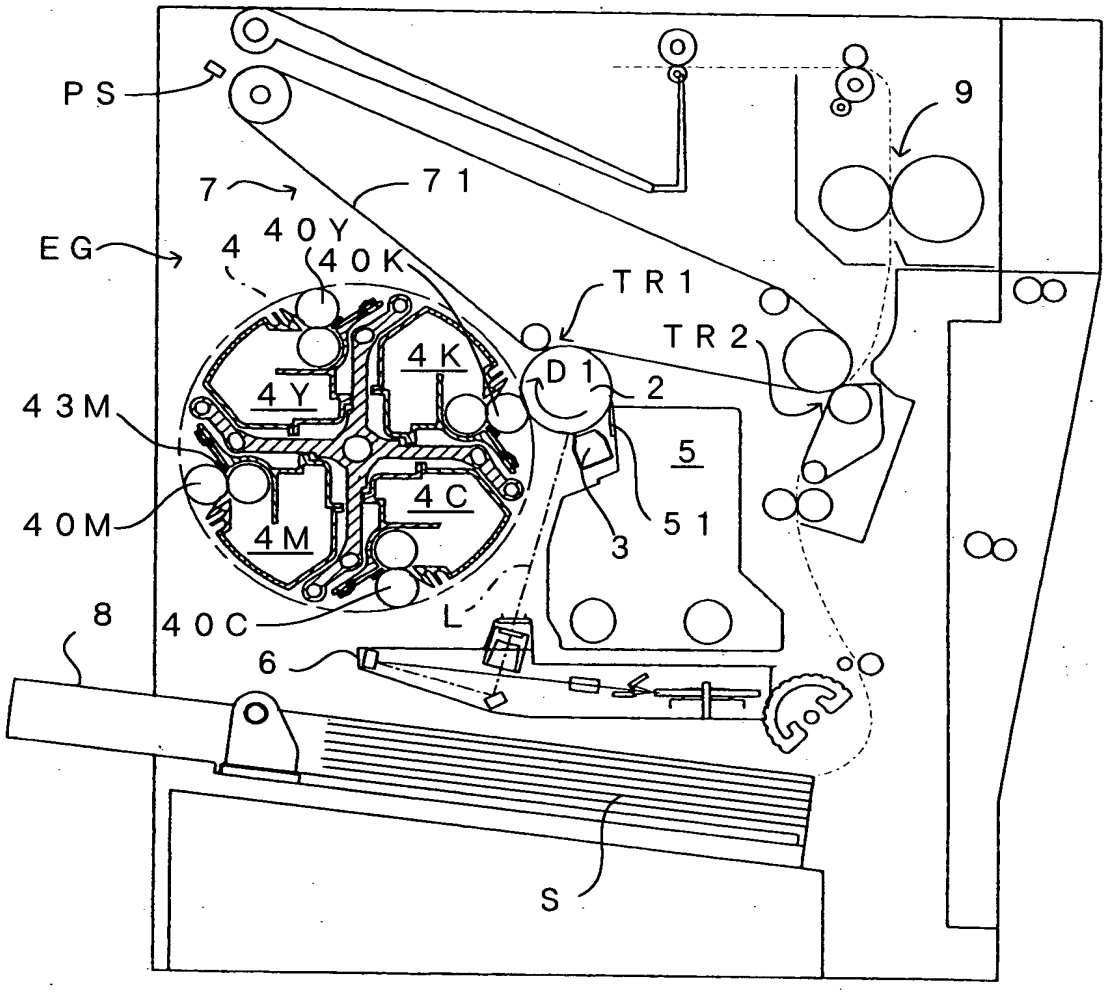


FIG. 2

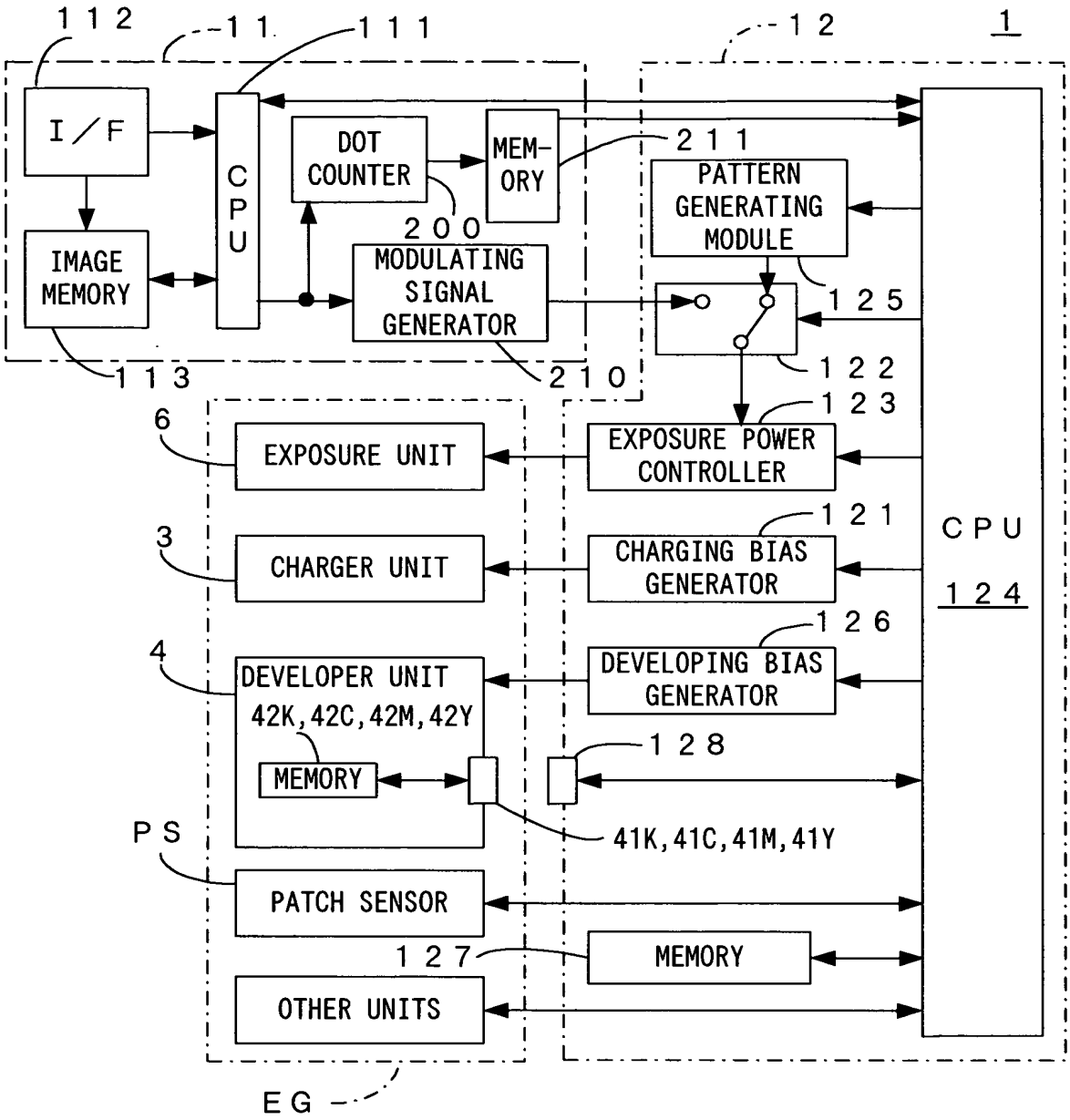

112
11
111
12
1
I/F
CPU
DOT COUNTER
MEM-ORY
211
200
PATTERN GENERATING MODULE
IMAGE MEMORY
MODULATING SIGNAL GENERATOR
125
122
113
210
123
6
EXPOSURE UNIT
EXPOSURE POWER CONTROLLER
121
3
CHARGER UNIT
CHARGING BIAS GENERATOR
CPU
124
126
4
DEVELOPER UNIT
42K,42C,42M,42Y
DEVELOPING BIAS GENERATOR
128
MEMORY
41K,41C,41M,41Y
PS
PATCH SENSOR
127
MEMORY
OTHER UNITS
EG

FIG. 3

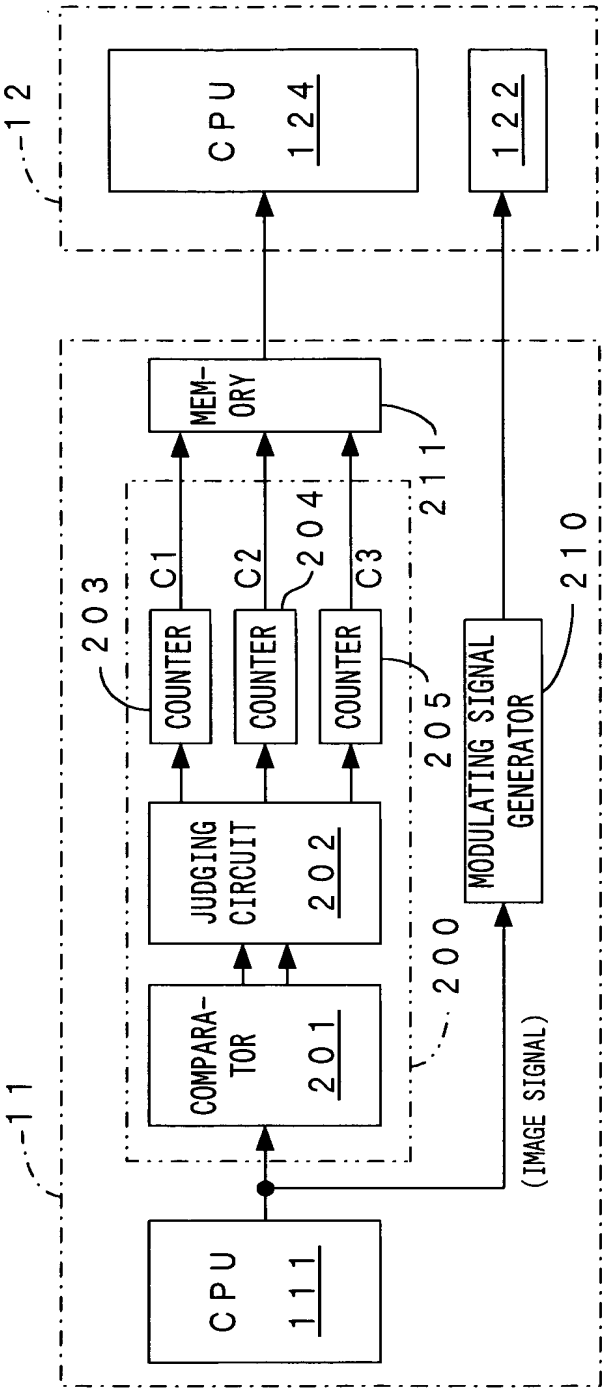

12
CPU 124
122
MEM-ORY
211
C1
C2
C3
204
203
COUNTER
COUNTER
COUNTER
205
JUDGING CIRCUIT 202
MODULATING SIGNAL GENERATOR
210
200
COMPARA-TOR 201
(IMAGE SIGNAL)
11
CPU 111

FIG. 4

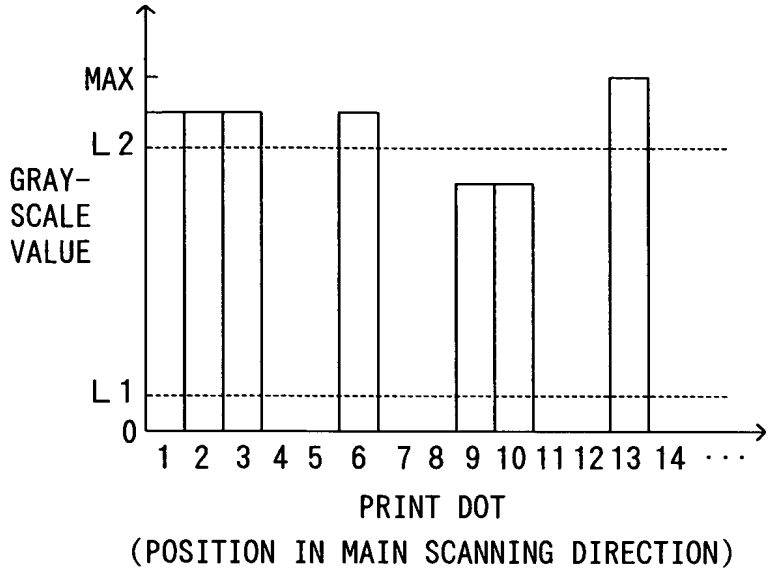

MAX
L2
GRAY-
SCALE
VALUE
L1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 ···
PRINT DOT
(POSITION IN MAIN SCANNING DIRECTION)

FIG. 5

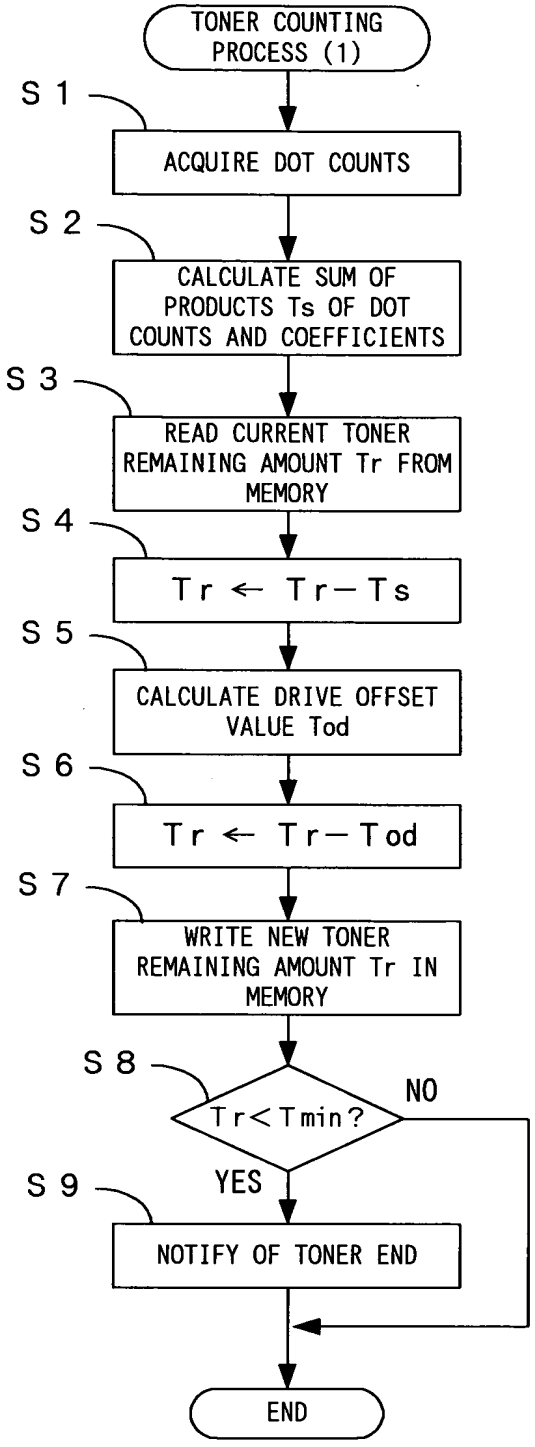

TONER COUNTING PROCESS (1)
S 1
ACQUIRE DOT COUNTS
S 2
CALCULATE SUM OF PRODUCTS Ts OF DOT COUNTS AND COEFFICIENTS
S 3
READ CURRENT TONER REMAINING AMOUNT Tr FROM MEMORY
S 4
Tr ← Tr − Ts
S 5
CALCULATE DRIVE OFFSET VALUE Tod
S 6
Tr ← Tr − Tod
S 7
WRITE NEW TONER REMAINING AMOUNT Tr IN MEMORY
S 8
Tr < Tmin ?
NO
YES
S 9
NOTIFY OF TONER END
END

FIG. 6

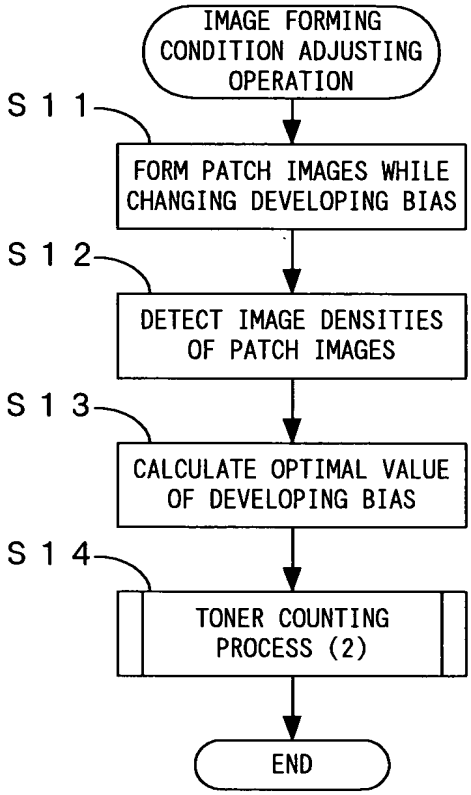


IMAGE FORMING CONDITION ADJUSTING OPERATION
S11
FORM PATCH IMAGES WHILE CHANGING DEVELOPING BIAS
S12
DETECT IMAGE DENSITIES OF PATCH IMAGES
S13
CALCULATE OPTIMAL VALUE OF DEVELOPING BIAS
S14
TONER COUNTING PROCESS (2)
END

FIG. 7

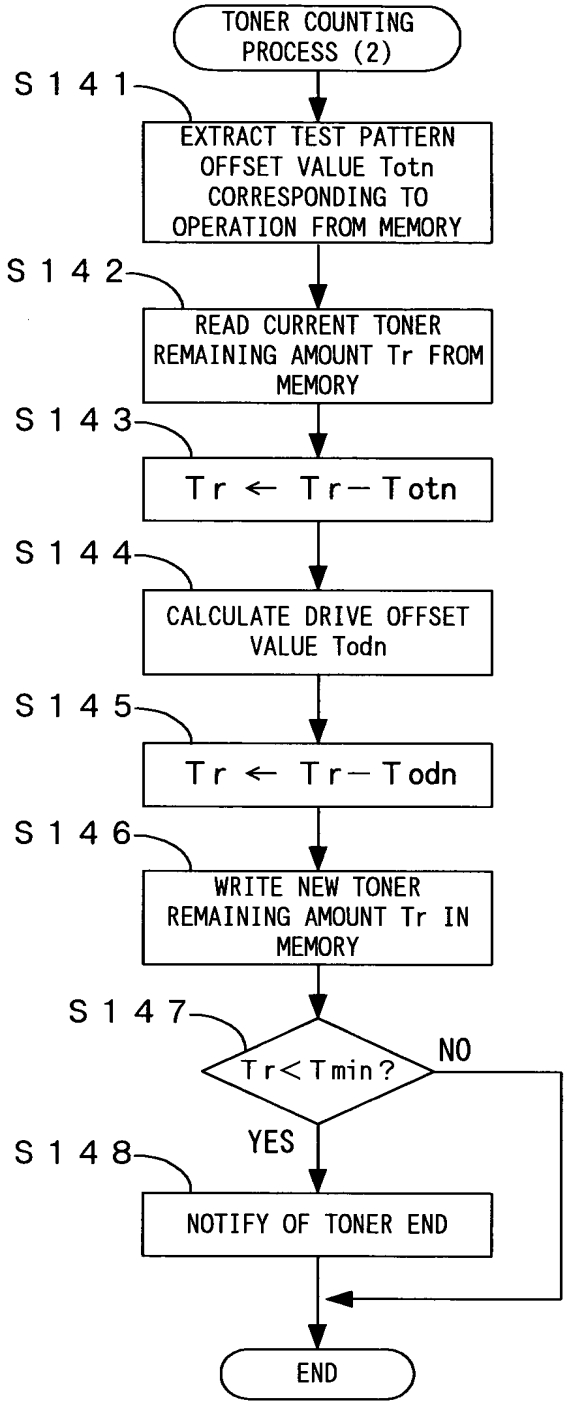

TONER COUNTING PROCESS (2)
S141
EXTRACT TEST PATTERN OFFSET VALUE Totn CORRESPONDING TO OPERATION FROM MEMORY
S142
READ CURRENT TONER REMAINING AMOUNT Tr FROM MEMORY
S143
Tr ← Tr−Totn
S144
CALCULATE DRIVE OFFSET VALUE Todn
S145
Tr ← Tr−Todn
S146
WRITE NEW TONER REMAINING AMOUNT Tr IN MEMORY
S147
Tr<Tmin?
NO
YES
S148
NOTIFY OF TONER END
END

FIG. 8

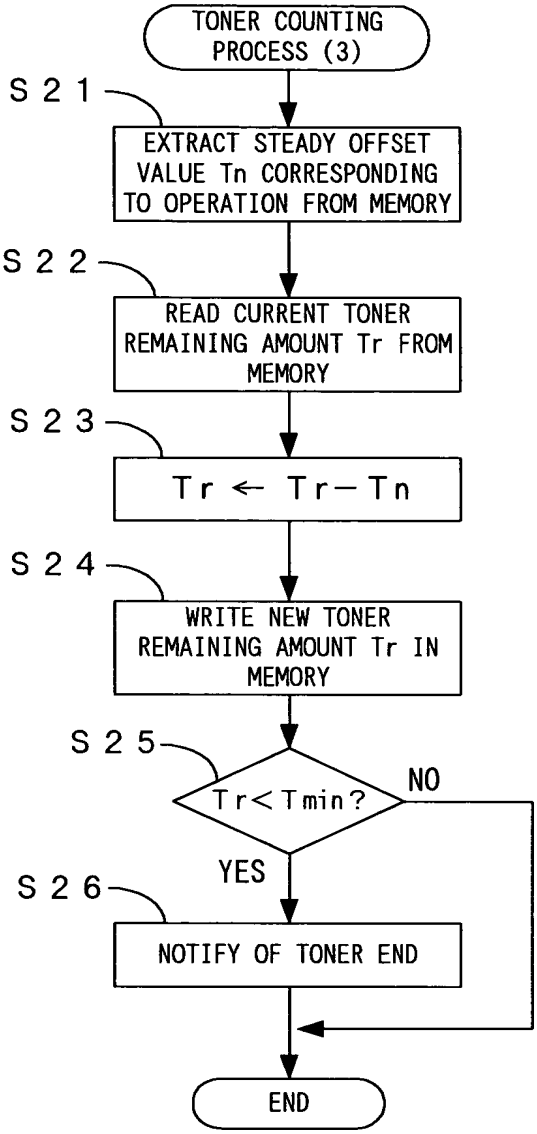

TONER COUNTING PROCESS (3)
S21
EXTRACT STEADY OFFSET VALUE Tn CORRESPONDING TO OPERATION FROM MEMORY
S22
READ CURRENT TONER REMAINING AMOUNT Tr FROM MEMORY
S23
Tr ← Tr−Tn
S24
WRITE NEW TONER REMAINING AMOUNT Tr IN MEMORY
S25
Tr<Tmin?
NO
YES
S26
NOTIFY OF TONER END
END

FIG. 9A

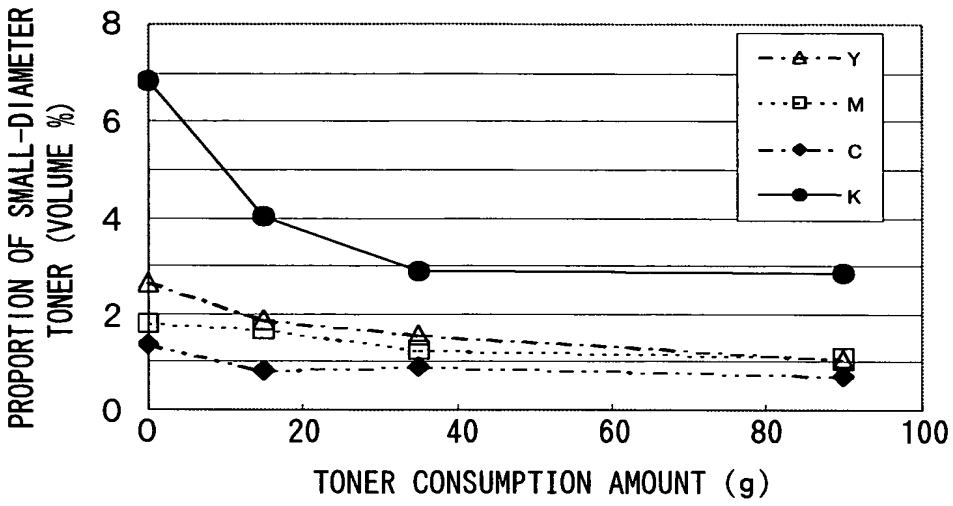

PROPORTION OF SMALL-DIAMETER TONER (VOLUME %)
8
6
4
2
0
0
20
40
60
80
100
TONER CONSUMPTION AMOUNT (g)
Y
M
C
K

FIG. 9B

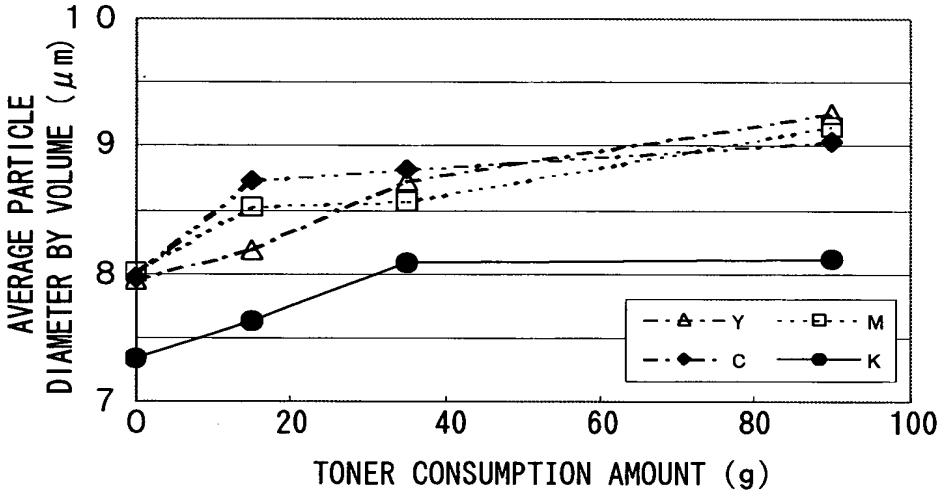

AVERAGE PARTICLE DIAMETER BY VOLUME (μm)
10
9
8
7
0
20
40
60
80
100
TONER CONSUMPTION AMOUNT (g)
Y
M
C
K

FIG. 10

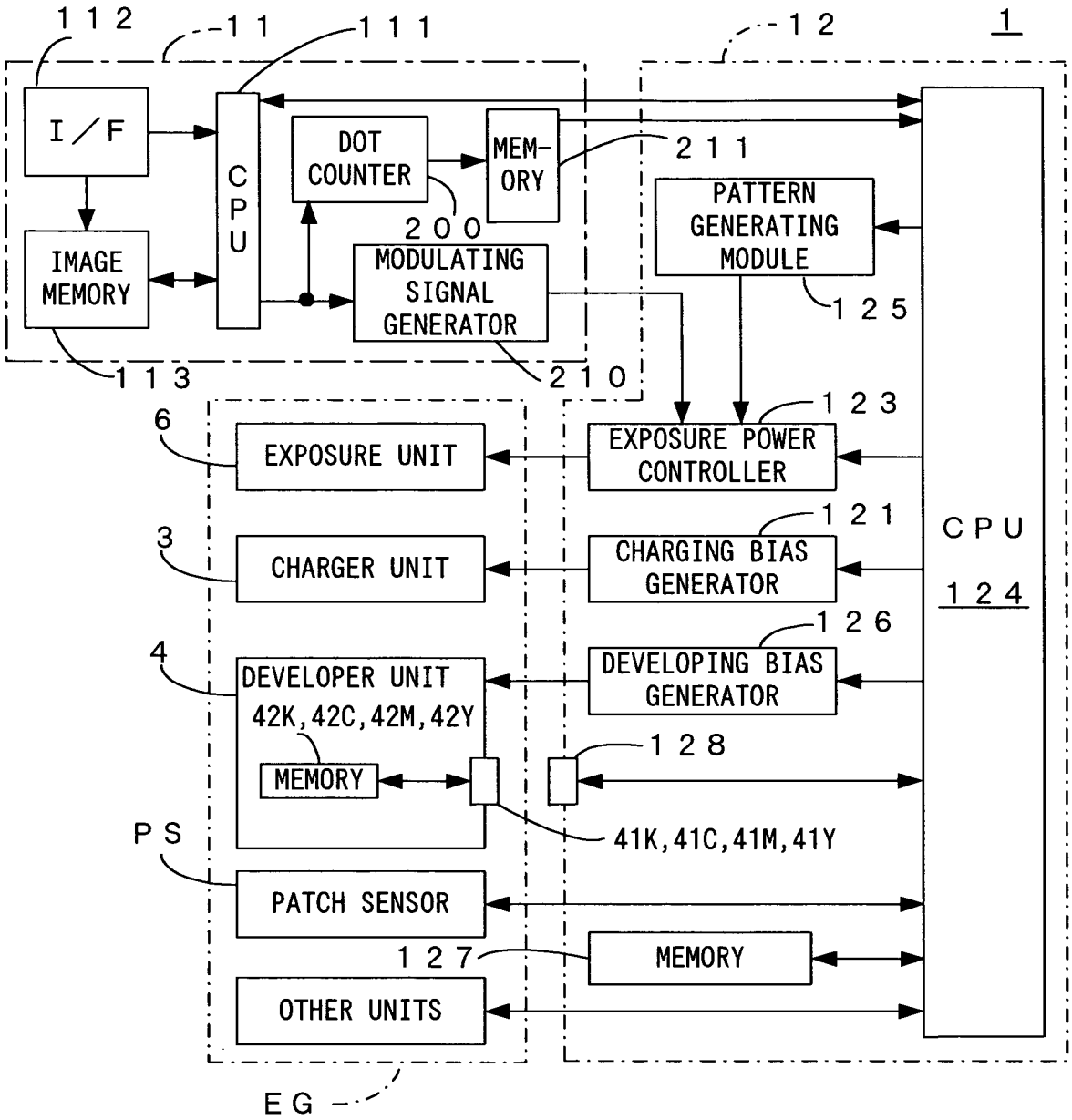


FIG. 11

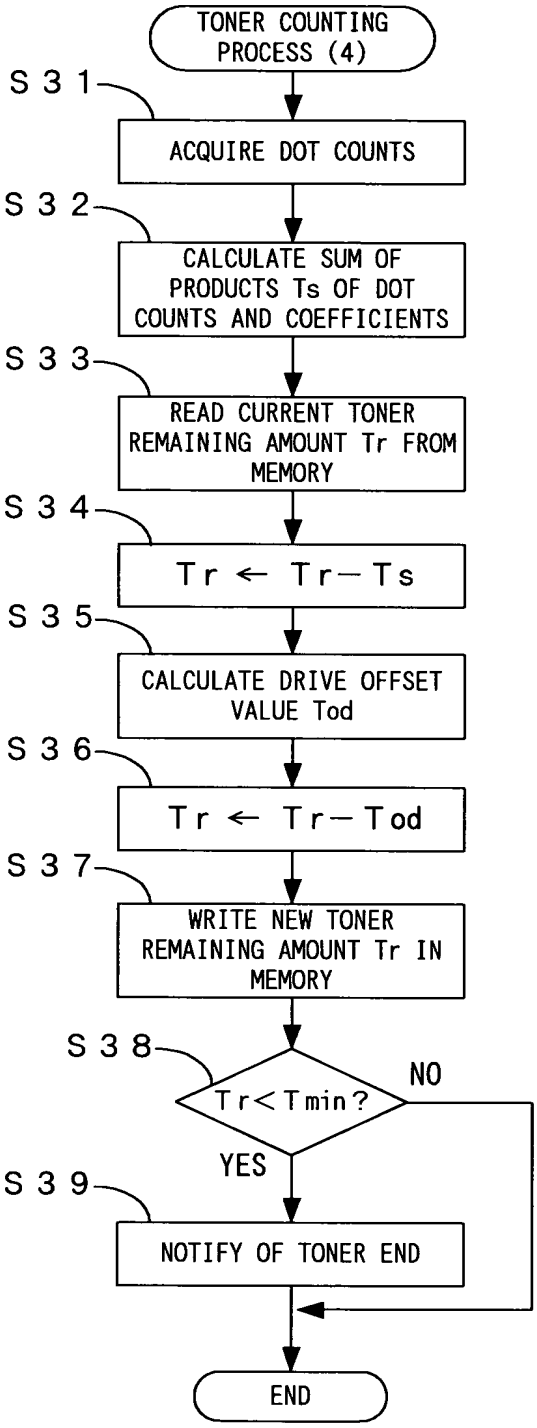

TONER COUNTING PROCESS (4)
S31
ACQUIRE DOT COUNTS
S32
CALCULATE SUM OF PRODUCTS Ts OF DOT COUNTS AND COEFFICIENTS
S33
READ CURRENT TONER REMAINING AMOUNT Tr FROM MEMORY
S34
Tr ← Tr−Ts
S35
CALCULATE DRIVE OFFSET VALUE Tod
S36
Tr ← Tr−Tod
S37
WRITE NEW TONER REMAINING AMOUNT Tr IN MEMORY
S38
Tr<Tmin?
NO
YES
S39
NOTIFY OF TONER END
END

FIG. 12

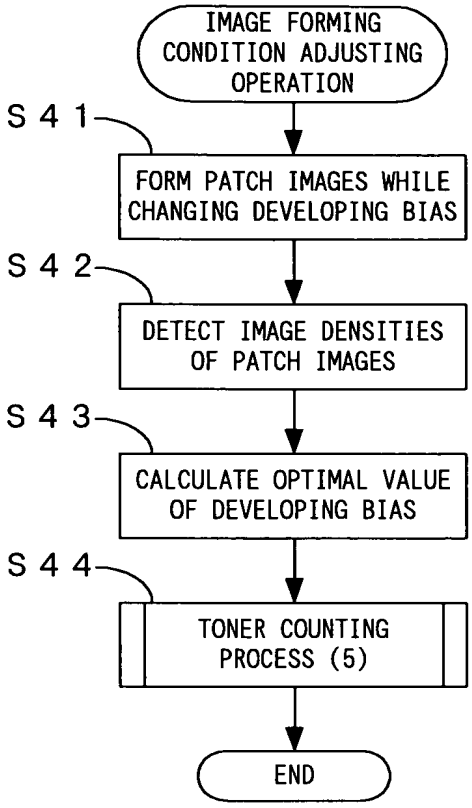


IMAGE FORMING CONDITION ADJUSTING OPERATION
S41
FORM PATCH IMAGES WHILE CHANGING DEVELOPING BIAS
S42
DETECT IMAGE DENSITIES OF PATCH IMAGES
S43
CALCULATE OPTIMAL VALUE OF DEVELOPING BIAS
S44
TONER COUNTING PROCESS (5)
END

FIG. 13

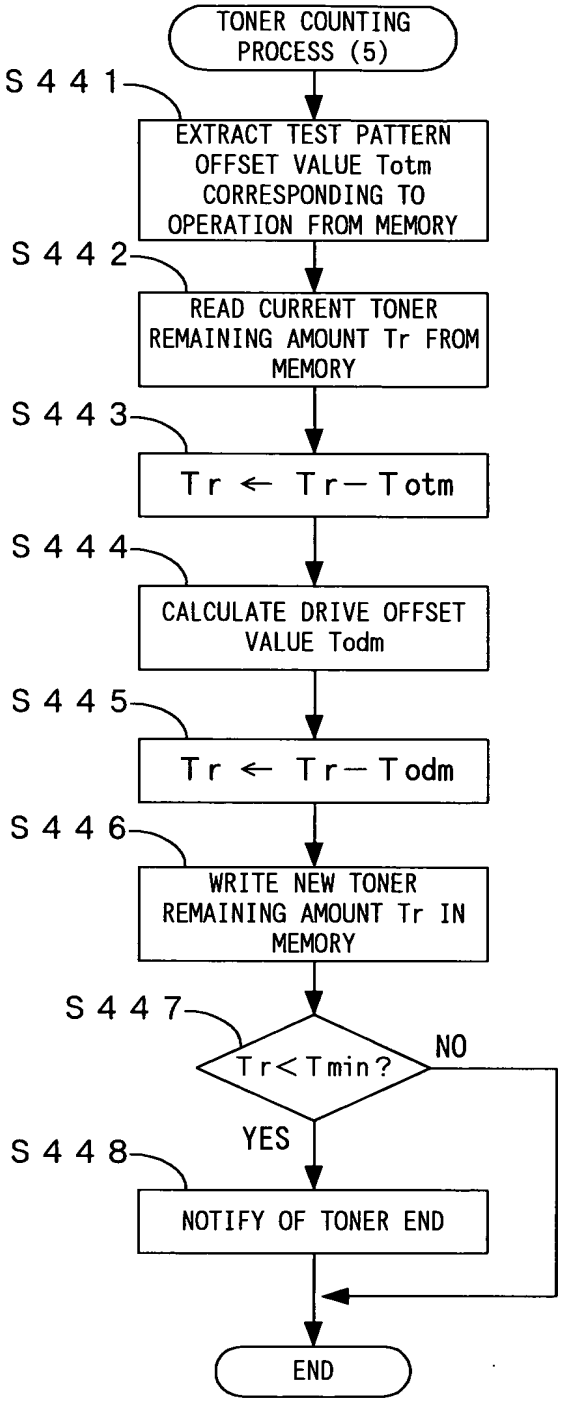

TONER COUNTING PROCESS (5)
S441
EXTRACT TEST PATTERN OFFSET VALUE Totm CORRESPONDING TO OPERATION FROM MEMORY
S442
READ CURRENT TONER REMAINING AMOUNT Tr FROM MEMORY
S443
Tr ← Tr − Totm
S444
CALCULATE DRIVE OFFSET VALUE Todm
S445
Tr ← Tr − Todm
S446
WRITE NEW TONER REMAINING AMOUNT Tr IN MEMORY
S447
Tr < Tmin ?
NO
YES
S448
NOTIFY OF TONER END
END

FIG. 14

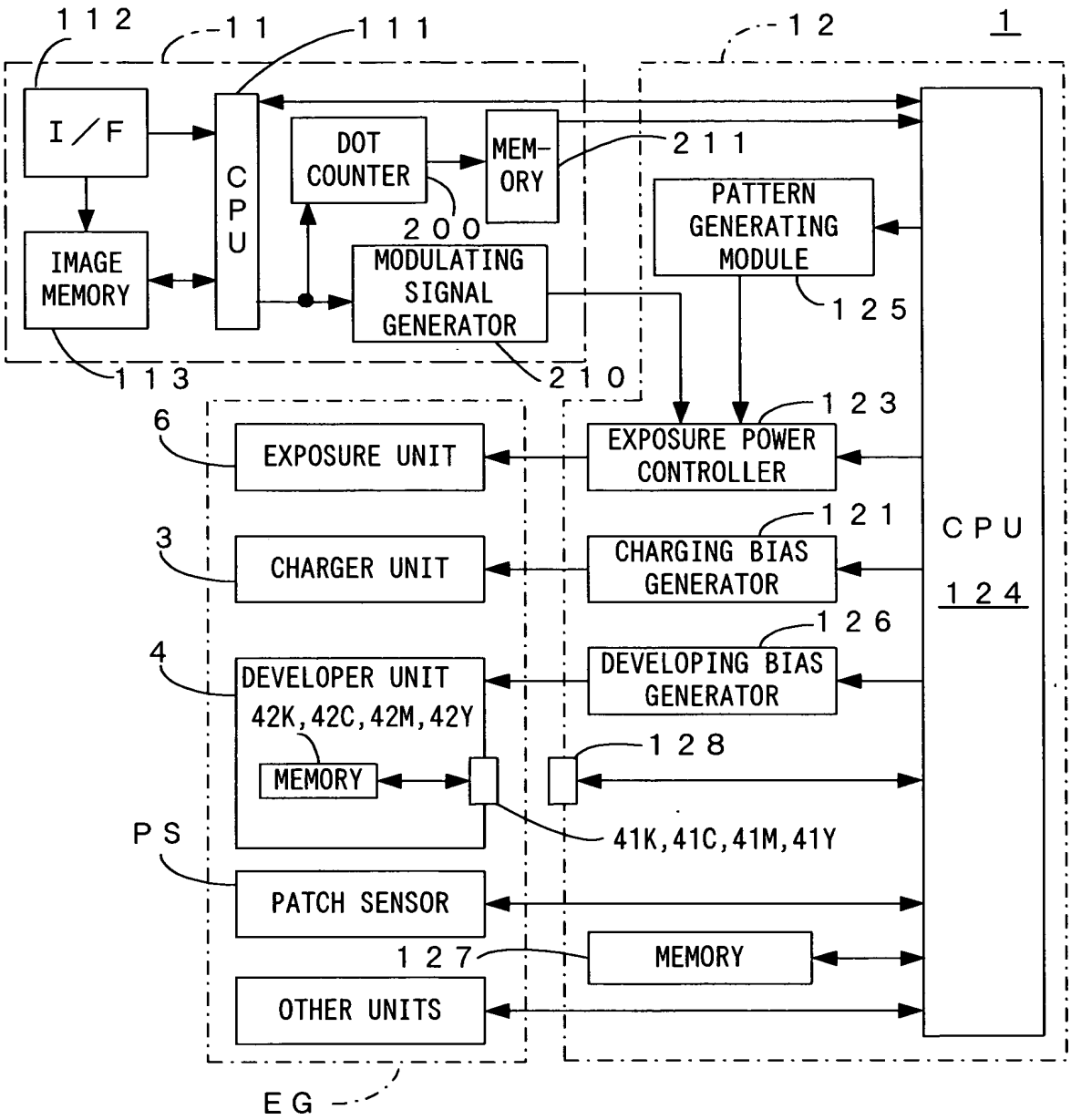

112
11
111
12
1
I/F
CPU
DOT COUNTER
MEM-ORY
211
200
PATTERN GENERATING MODULE
125
IMAGE MEMORY
MODULATING SIGNAL GENERATOR
113
210
123
6
EXPOSURE UNIT
EXPOSURE POWER CONTROLLER
121
3
CHARGER UNIT
CHARGING BIAS GENERATOR
CPU
124
126
4
DEVELOPER UNIT
42K,42C,42M,42Y
DEVELOPING BIAS GENERATOR
128
MEMORY
41K,41C,41M,41Y
PS
PATCH SENSOR
127
MEMORY
OTHER UNITS
EG

FIG. 15A

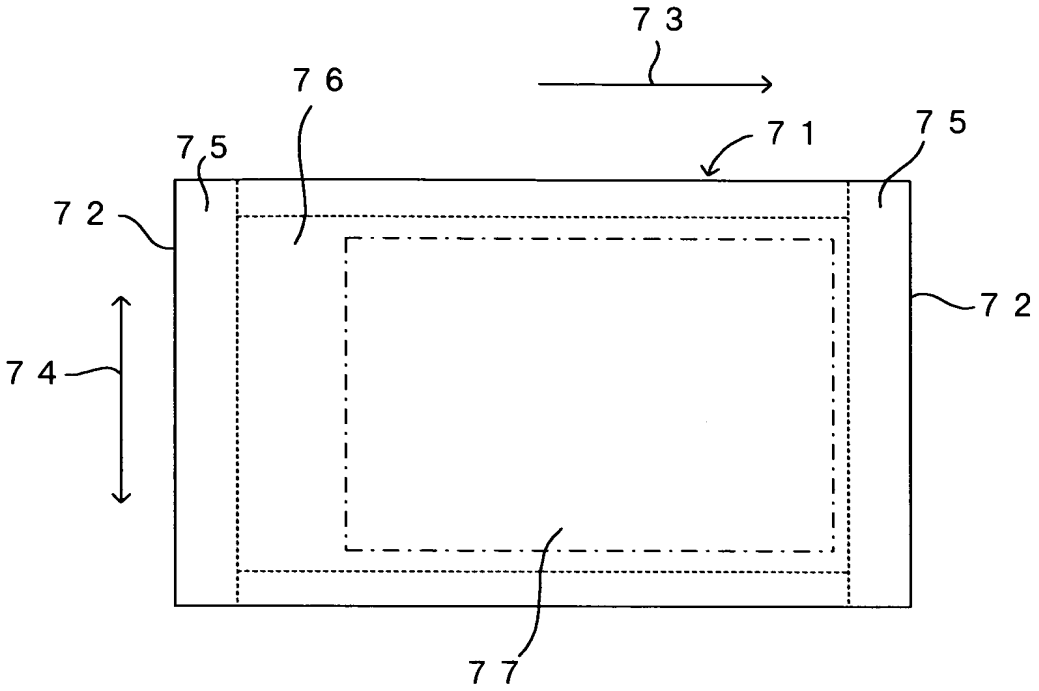


FIG. 15B

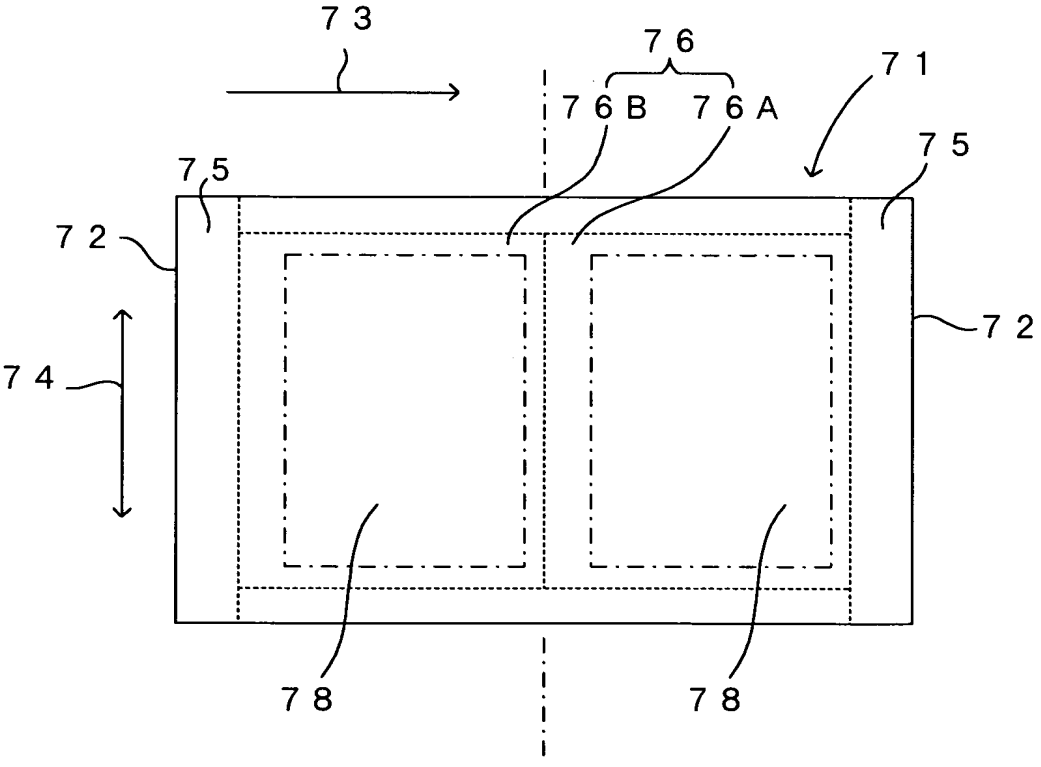


FIG. 16

OFFSET VALUE TABLE DATA		ONE OF TWO PAGES	OTHERS
HIGH IMAGE-QUALITY MODE	OHP	T11	T15
	NON-OHP	T12	T16
TONER SAVE MODE	OHP	T13	T17
	NON-OHP	T14	T18

FIG. 17

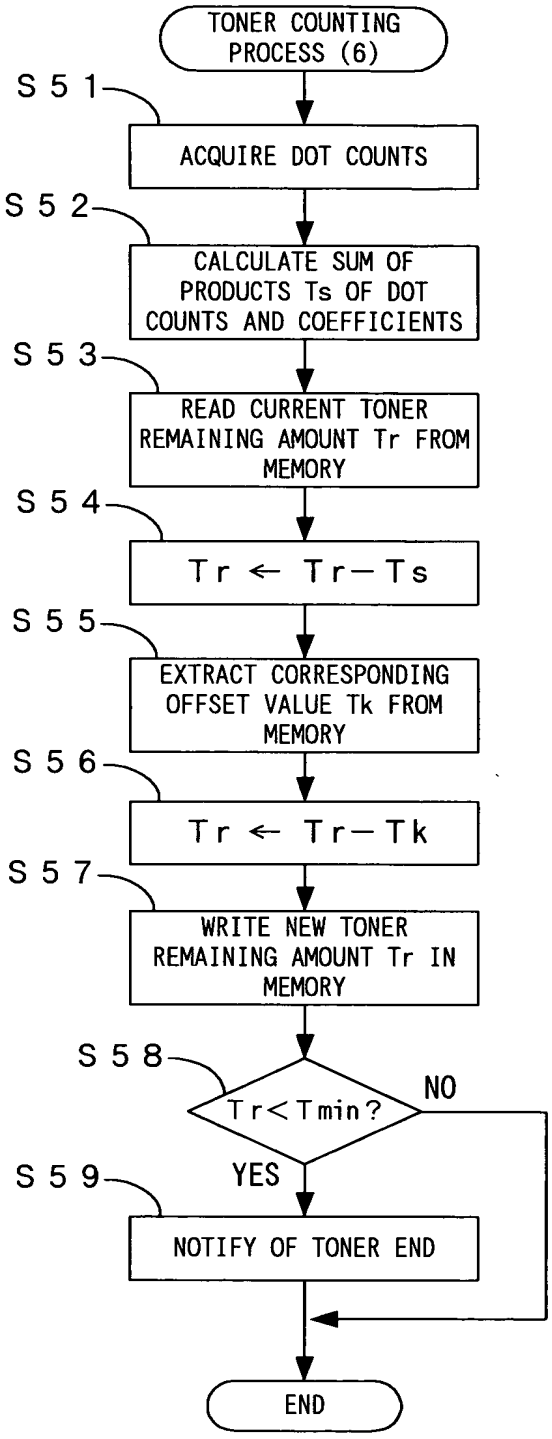

TONER COUNTING PROCESS (6)
S51
ACQUIRE DOT COUNTS
S52
CALCULATE SUM OF PRODUCTS Ts OF DOT COUNTS AND COEFFICIENTS
S53
READ CURRENT TONER REMAINING AMOUNT Tr FROM MEMORY
S54
Tr ← Tr−Ts
S55
EXTRACT CORRESPONDING OFFSET VALUE Tk FROM MEMORY
S56
Tr ← Tr−Tk
S57
WRITE NEW TONER REMAINING AMOUNT Tr IN MEMORY
S58
Tr<Tmin?
NO
YES
S59
NOTIFY OF TONER END
END

FIG. 18

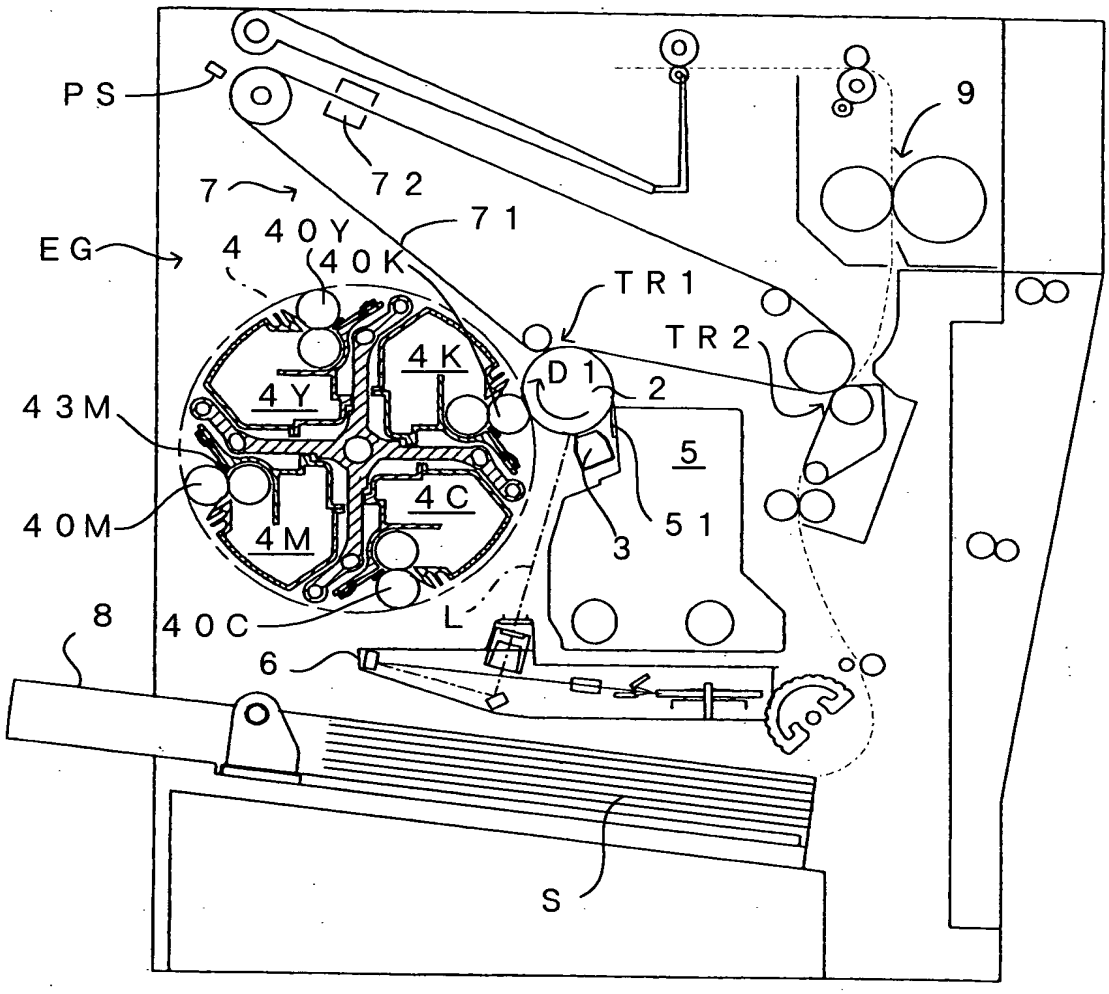


FIG. 19

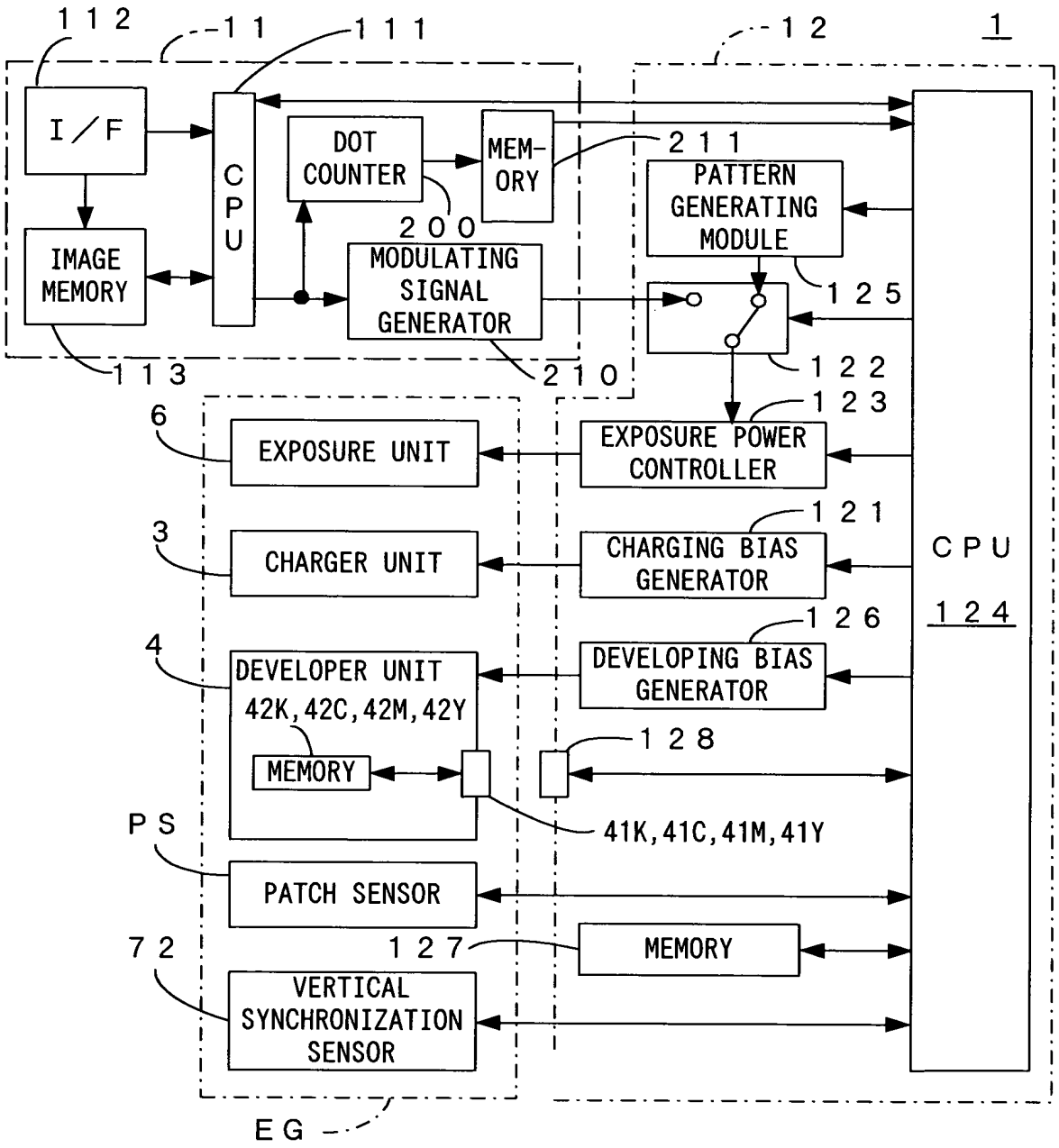

112
11
111
12
1
I/F
CPU
DOT COUNTER
MEM-ORY
211
200
PATTERN GENERATING MODULE
IMAGE MEMORY
MODULATING SIGNAL GENERATOR
125
122
113
210
123
6
EXPOSURE UNIT
EXPOSURE POWER CONTROLLER
121
3
CHARGER UNIT
CHARGING BIAS GENERATOR
CPU
124
126
4
DEVELOPER UNIT
42K,42C,42M,42Y
DEVELOPING BIAS GENERATOR
128
MEMORY
41K,41C,41M,41Y
PS
PATCH SENSOR
72
127
MEMORY
VERTICAL SYNCHRONIZATION SENSOR
EG

FIG. 20

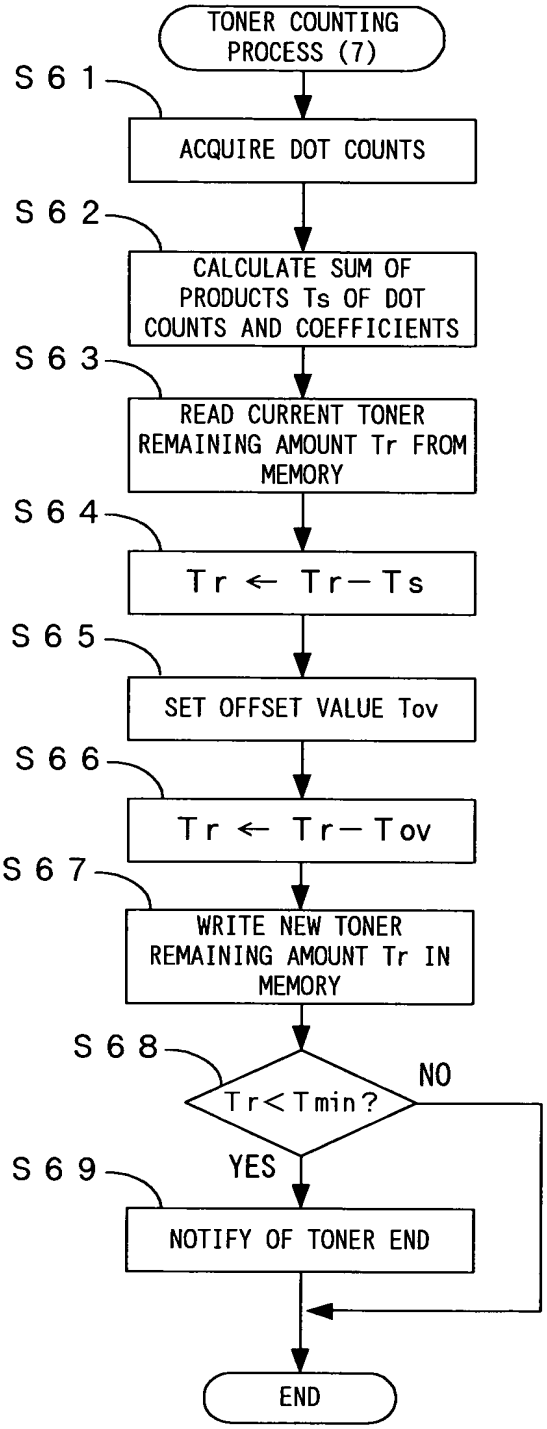

TONER COUNTING PROCESS (7)
S61
ACQUIRE DOT COUNTS
S62
CALCULATE SUM OF PRODUCTS Ts OF DOT COUNTS AND COEFFICIENTS
S63
READ CURRENT TONER REMAINING AMOUNT Tr FROM MEMORY
S64
Tr ← Tr−Ts
S65
SET OFFSET VALUE Tov
S66
Tr ← Tr−Tov
S67
WRITE NEW TONER REMAINING AMOUNT Tr IN MEMORY
S68
Tr<Tmin?
NO
YES
S69
NOTIFY OF TONER END
END

FIG. 21A

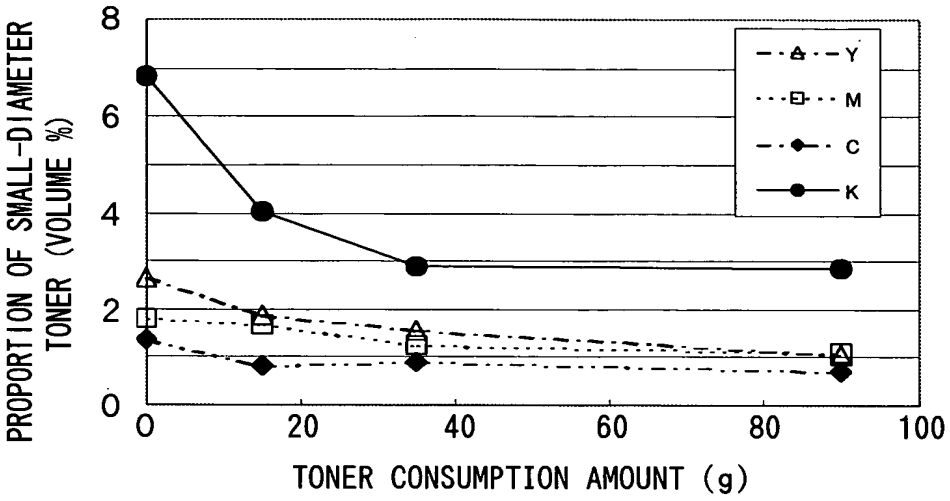


FIG. 21B

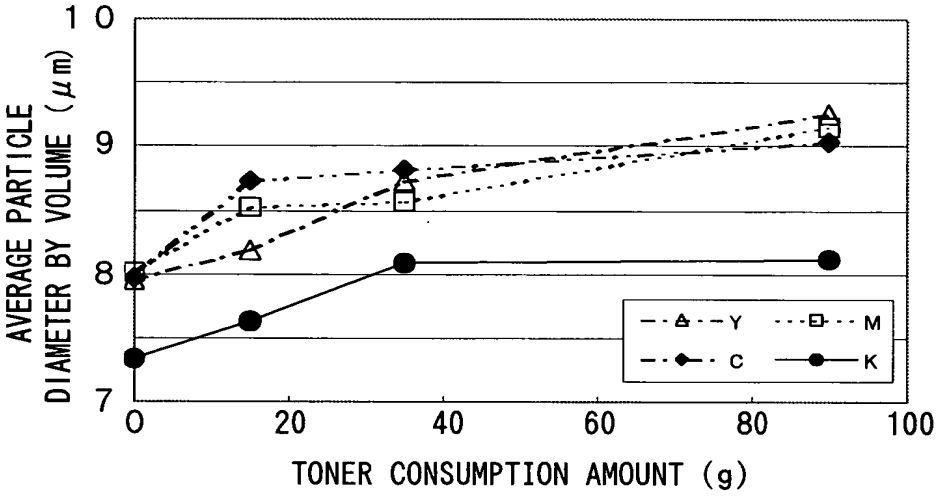


FIG. 22

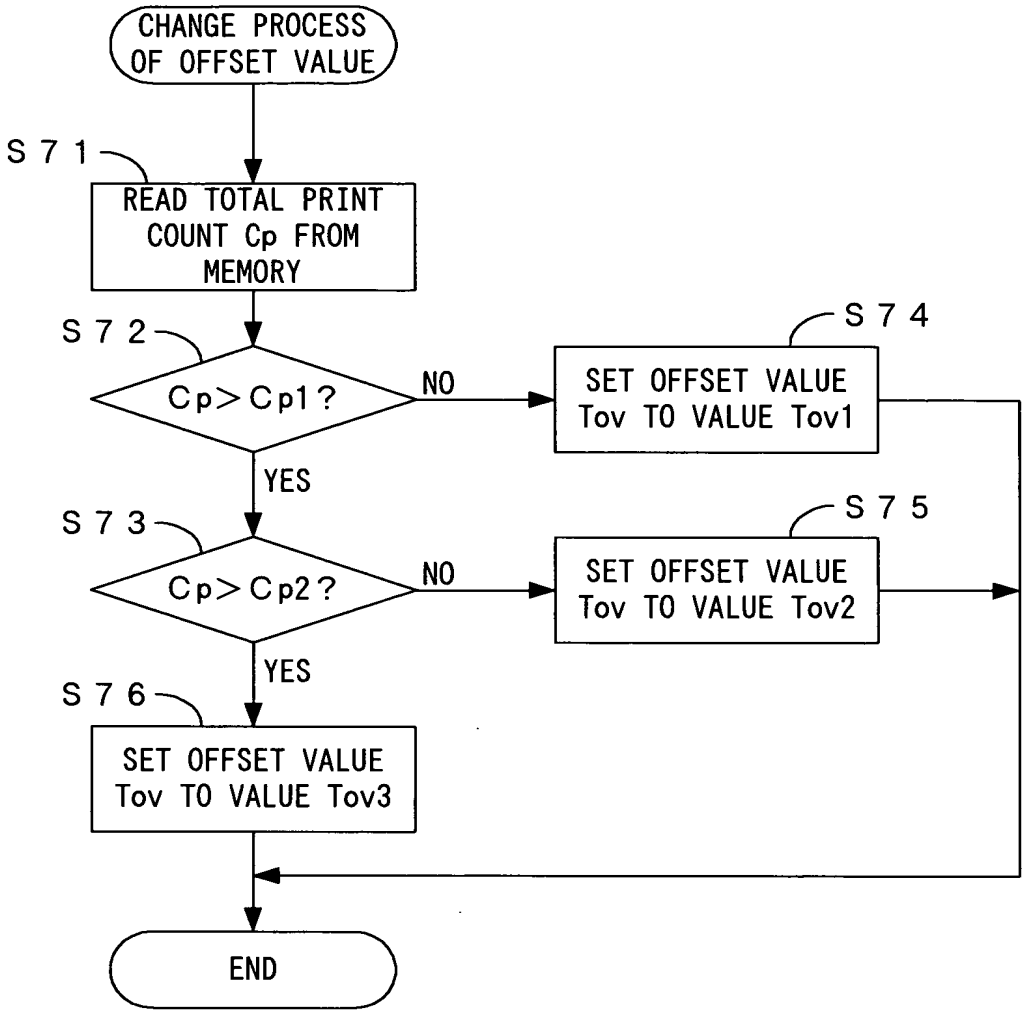

CHANGE PROCESS OF OFFSET VALUE
S71
READ TOTAL PRINT COUNT Cp FROM MEMORY
S72
Cp>Cp1?
NO
S74
SET OFFSET VALUE Tov TO VALUE Tov1
YES
S73
Cp>Cp2?
NO
S75
SET OFFSET VALUE Tov TO VALUE Tov2
YES
S76
SET OFFSET VALUE Tov TO VALUE Tov3
END

FIG. 23

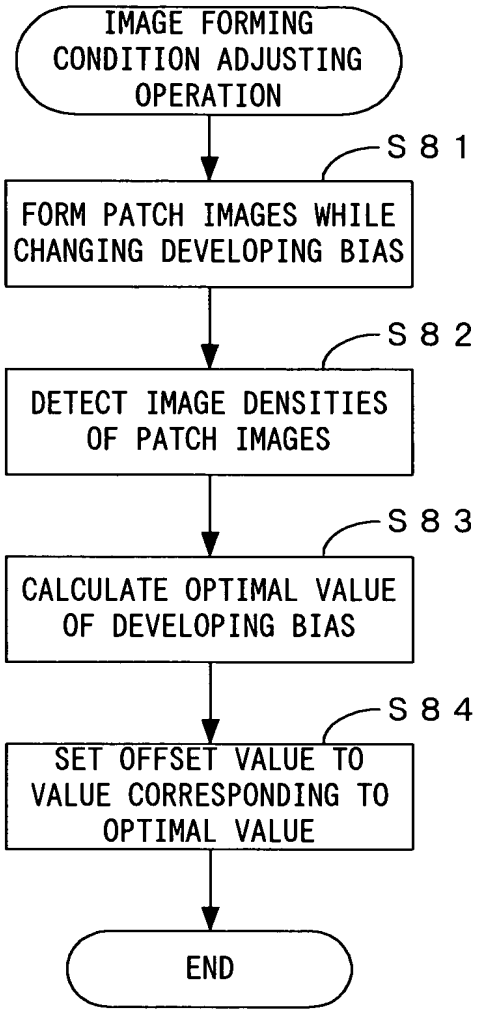


IMAGE FORMING CONDITION ADJUSTING OPERATION
S81
FORM PATCH IMAGES WHILE CHANGING DEVELOPING BIAS
S82
DETECT IMAGE DENSITIES OF PATCH IMAGES
S83
CALCULATE OPTIMAL VALUE OF DEVELOPING BIAS
S84
SET OFFSET VALUE TO VALUE CORRESPONDING TO OPTIMAL VALUE
END

FIG. 24

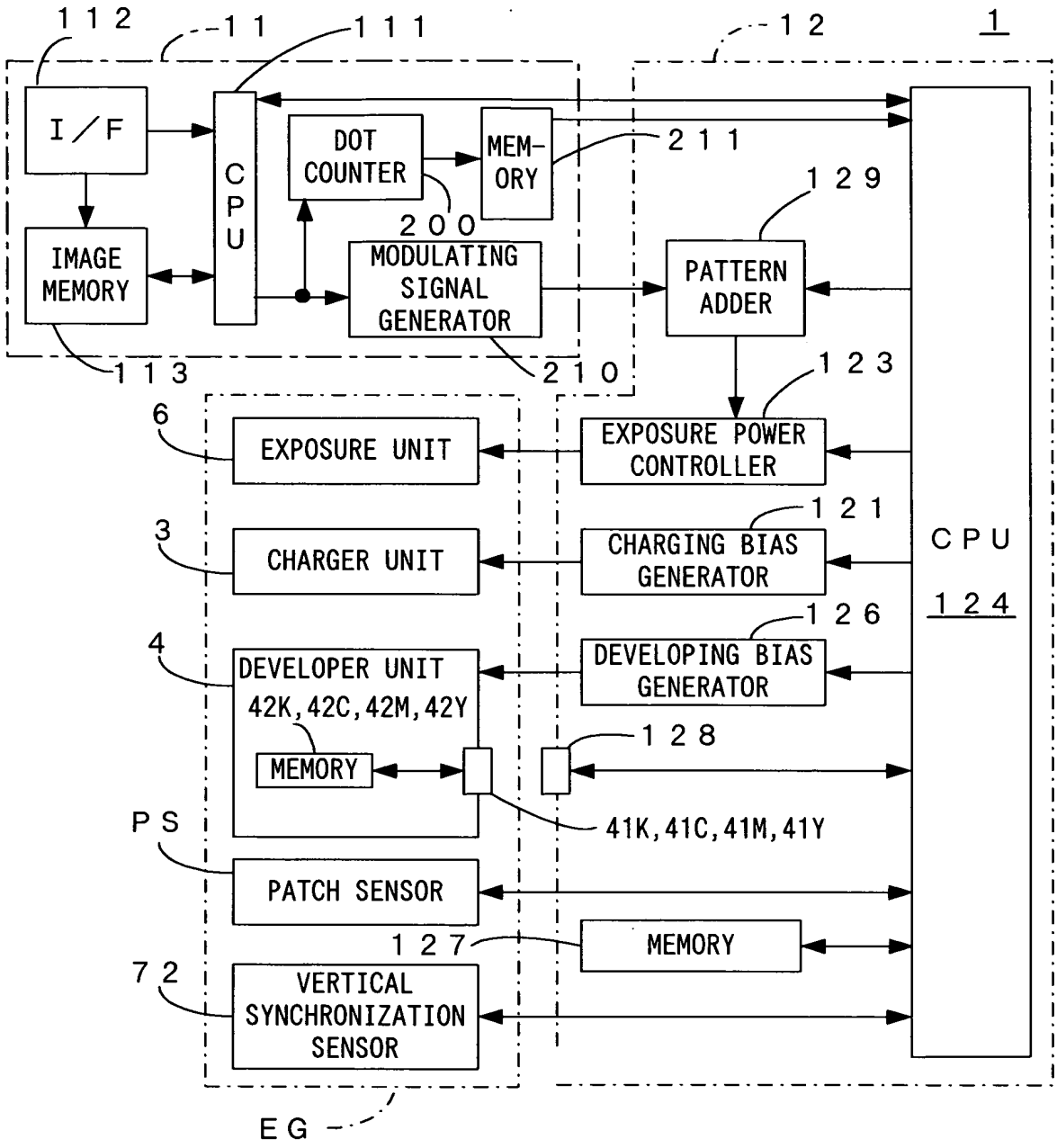


FIG. 25

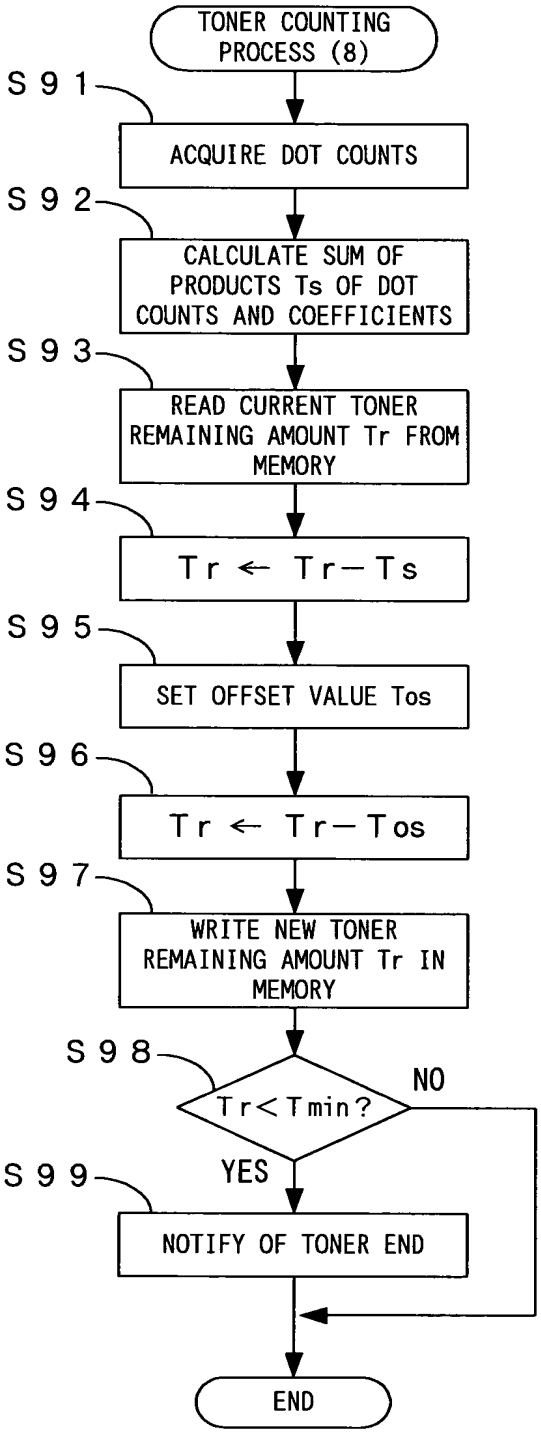
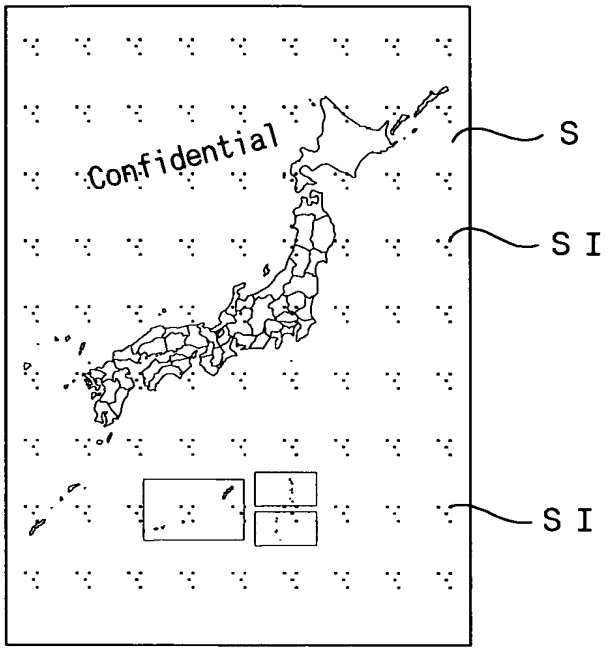

TONER COUNTING PROCESS (8)
S91
ACQUIRE DOT COUNTS
S92
CALCULATE SUM OF PRODUCTS Ts OF DOT COUNTS AND COEFFICIENTS
S93
READ CURRENT TONER REMAINING AMOUNT Tr FROM MEMORY
S94
Tr ← Tr−Ts
S95
SET OFFSET VALUE Tos
S96
Tr ← Tr−Tos
S97
WRITE NEW TONER REMAINING AMOUNT Tr IN MEMORY
S98
Tr<Tmin?
NO
YES
S99
NOTIFY OF TONER END
END

FIG. 26



BACKGROUND ART